PATENT SPECIFICATION (11) 1 356 386

1 356 386

(21) Application No. 26893/70 (22) Filed 3 June 1970 (19)

(23) Complete Specification filed 26 May 1971

(44) Complete Specification published 12 June 1974

(51) International Classification A61B 17/34

(52) Index at acceptance
A5R 43 51 53

(72) Inventors EDWARD MOSS
and WALTER WARRICK WRIGHT FORBES

(54) ARTERY ENTRY TOOL

(71) We, NATIONAL RESEARCH DEVELOPMENT CORPORATION, a British Corporation established by Statute of Kingsgate House, 66—74 Victoria Street, London, S.W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a tool for providing an entry through a tissue wall, for example into an artery. It has one application in providing an entry into an artery for the clearance drill of British Patent Specification No. 1,235,321.

According to the present invention there is provided a surgical tool for providing an entry through a tissue wall, comprising: a first elongate tubular member having one end portion of greater radial dimensions than the remainder thereof, which end portion is convergently tapered toward its adjacent free end and defines, remotely from said free end, a re-entrant shoulder; a second elongate tubular member having one end portion thereof tapered towards its adjacent free end, extending longitudinally within said first member with their respective tapered end portions similarly directed, and demountably connected with said first member to locate said tapered end portions in a continuous successively tapering relationship; an elongate cutting member formed with a blade at one end thereof, and coupled with and longitudinally slidably located in said second member with said blade nearer to said tapered end portions; a first spring acting between said second member and said cutting member to withdraw said blade within said second member; a plunger connected with said cutting member remotely from said blade and operable, against the action of said first spring, to project said blade from said second member to form an incision in a tissue wall and afford entry for said tapered end portions therethrough; a sleeve longitudinally slidably mounted around said first member; a second spring acting between said first member and said sleeve, and urging said sleeve towards engagement at one end thereof with said shoulder to clamp therebetween the circumferential tissue defining said incision; and a catch to hold said sleeve, against the action of said second spring, removed from said shoulder when making said incision.

A valve may be provided for closing the bore of said tubular member when the elongated member is removed therefrom. The valve may be spring-loaded to effect such closure automatically.

To enable the nature of the present invention to be more readily understood, attention is directed by way of example to the accompanying drawings wherein:

Figure 1 is a sectional elevation of an embodiment of the invention.

Figure 2 is a view in the direction II—II of Figure 1 on an enlarged scale.

Figure 3 is a view in the direction III—III of Figure 1 on an enlarged scale.

In Figure 1 an elongated tubular member 1 has a tapered end 2. As will be seen in Figures 2 and 3 the taper is generally circular in cross-section but includes two flats 3 which terminate in a slit-like aperture 4, extending within the tapered end to communicate with the bore of member 1. Member 1 is located within a further tubular member 5 by means of screw-threaded portions 6. When so located, the tapered end 2 of member 1 projects beyond the end of member 5, the latter being tapered as shown at 7 to continue the taper of end 2. Tapered portion 7 terminates in a re-entrant shoulder 8 of which the radial surface preferably includes a circumferential depression as shown.

Axially slidable on member 5 is a sleeve 9. The sleeve is spring-loaded against shoulder 8 by a spring 10, but can be held away therefrom by a catch comprising a right-angled slot 11 in which runs a pin 12 extending from member 5. The sleeve is provided with a circumferential stop 20 adjacent the sleeve end loaded against the shoulder 8.

[Price 25p]

A rod 13 is axially movable within member 1 and terminates in a blade 14 which can be projected through, or withdrawn into, aperture 4 by the axial movement. Figure 1 shows blade 14 withdrawn, and Figure 3 the blade projected. The other end of rod 13 terminates in a plunger 15 which is spring-loaded by a spring 16 in a sense to cause the blade 14 to be withdrawn. The blade 14 is aligned in slit 4 by means of a screw 21 extending from the member 1 to run in a groove 22 in the plunger 15.

Tubular member 5 is provided with a valve comprising a transversely slidable valve plate 17 having a hole 18 therein. The plate can be slid to align its hole 18 with the bore of the member 5 to allow entry of the member 1. However, the plate 17 is spring-loaded by a spring 19 to move from this position to one in which the plate seals the bore of the member 5. Naturally, this spring action is inhibited by the presence of the member 1 passing through the hole 18.

In the use of the illustrated tool embodiment, sleeve 9 is first held back from shoulder 8 by its catch, and the aperture 4 held against the artery with blade 14 withdrawn. An incision is then made by depressing plunger 15, and the tapered ends 2 and 7 passed into the incision until the edges of the latter curve over shoulder 8. Sleeve 9 is then released so that the edges of the incision are clamped between the sleeve and the shoulder. The circumferential depression in the latter is aligned with the edge of the sleeve and so improves the clamping. Thereafter, member 1, together with rod 13, is unscrewed from tubular member 5, the valve closing automatically as it is withdrawn to reduce loss of blood. Apparatus which it is desired to introduce into the artery, e.g. the bit of the aforementioned drill, or probes or catheters, can then be passed down the bore of tubular member 5, the valve being opened manually to allow such passage.

The stop 20 prevents the assembly being pushed too far into the incision.

It will be noted that spring 10 and the associated catch slot 11 and pin 12, plunger 15 and spring 16 together with associated screw 21 and slot 22, and valve plate 17 and associated spring 19, are located remotely from the tapered end of the illustrated tool. This facilitates manufacture of the tapered end portion of the tool, which is the proximal end relative to an associated entry site, to suitably small dimensions, while associated operations by a surgeon or other personnel are effected at the distal end of the tool. In this connection, it is noted that Figure 1 is approximately to scale and the bore of tubular member 5 is about $^{8}/_{10}$ inch in the relevant tool embodiment.

Also, it is noted that the illustrated tool embodiment is made of stainless steel with the tapered surfaces 2 and 7, including the flats 3, being of highly polished finished.

Various modifications of the above-described tool are possible. For example in a simplified version rod 13 and aperture 4 are dispensed with, and a blade or spear-edge provided at the tip of the tapered end which, in use, is pushed through the artery wall.

The form of valve shown in Figure 1 may be replaced by, for example, a spring-loaded ball valve of known form.

WHAT WE CLAIM IS:—

1. A surgical tool for providing an entry through a tissue wall, comprising:—

a first elongate tubular member having one end portion of greater radial dimensions than the remainder thereof, which end portion is convergently tapered towards its adjacent free end and defines, remotely from said free end, a re-entrant shoulder;

a second elongate tubular member having one end portion thereof tapered towards its adjacent free end, extending longitudinally within said first member with their respective tapered end portions similarly directed, and demountably connected with said first member to locate said tapered end portions in a contiguous successively tapering relationship;

an elongate cutting member formed with a blade at one end thereof, and coupled with and longitudinally slidably located in said second member with said blade nearer to said tapered end portions;

a first spring acting between said second member and said cutting member to withdraw said blade within said second member;

a plunger connected with said cutting member remotely from said blade and operable, against the action of said first spring, to project said blade from said second member to form an incision in a tissue wall and afford entry for said tapered end portions therethrough;

a sleeve longitudinally slidably mounted around said first member;

a second spring acting between said first member and said sleeve, and urging said sleeve towards engagement at one end thereof with said shoulder to clamp therebetween the circumferential tissue defining said incision; and

a catch to hold said sleeve, against the action of said second spring, removed from said shoulder when making said incision.

2. A tool according to claim 1 wherein said shoulder is formed with a circumferential depression therearound aligned with the adjacent end of said sleeve.

3. A tool according to claim 1 or 2 wherein said second member is formed with a slit aperture in its tapered end for passage

of said blade therethrough, and said cutting member is coupled with said second member to key the same to align said blade with said slit aperture.

4. A tool according to claim 1, 2 or 3 comprising a spring-loaded valve connected with said first member to close the bore thereof automatically upon demounting of said second member and said cutting member therefrom.

G. PARKER,
Chartered Patent Agent,
Agent for the Applicants.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1974.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1356386 COMPLETE SPECIFICATION

1 SHEET This drawing is a reproduction of the Original on a reduced scale

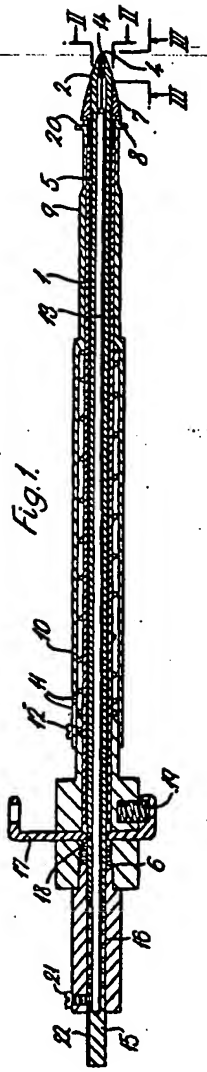

Fig. 1.

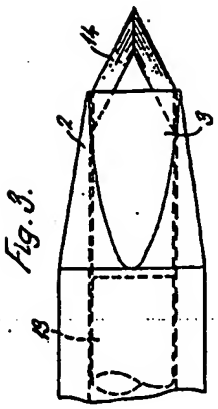

Fig. 3.

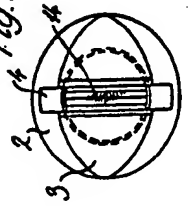

Fig. 2.